

REMARKS

The application has been amended to place the application in condition for allowance at the time of the next Official Action.

A substitute abstract of the disclosure is provided on an accompanying separate sheet.

Claims 1-8 were previously pending in the application. Claim 5 is cancelled and new claims 9-11 are added. Therefore, claims 1-11 are presented for consideration.

Claims 1-4 and 6-8 are rejected as anticipated by TSAI et al. 6,524,167. This rejection is respectfully traversed.

The position set forth in the Official Action is that the compounds disclosed by TSAI et al. are triazole based compounds. This position is believed untenable for at least three reasons.

First, applicant has defined "triazole based compound" in the specification, and the compounds of TSAI et al. do not meet this definition. Applicant has set forth on page 18, lines 7-24 of the present application, that a triazole-based compound implies triazole or its derivative. The recited examples of a triazole-based compound include 1,2,4-triazole, 1,2,3-triazole and their derivatives.

The organic compounds disclosed by TSAI et al. contain an azole group, such as benzotriazole, mercaptobenzotriazole, or 5-methyl-1-benzotriazole. These compounds contain an azole group

that is benzene based, so they are not triazole-based compounds as defined on page 18, lines 7-10 of the present application. Additionally, such interpretation of the claims is not consistent with the interpretation that those skilled in the art would reach. (See *In re Cortright*, 165 F.3d 1353, 1359, 49 USPQ2d 1464, 1468 (Fed. Cir. 1999)).

Moreover, page 32, lines 1-14 of the present application specifically distinguish 1,2,4-triazole from benzotriazole. As noted in Table 3 on page 32, benzotriazole is compared to 1,2,4-triazole and the results demonstrate that a polishing slurry containing benzotriazole cannot obtain the high polishing rate. Accordingly, the organic compounds disclosed by TSAI et al. are neither a triazole-based compound nor do these compounds achieve an acceptable polishing result as would be recognized by one of ordinary skill in the art.

Second, independent claims 1 and 2 provide that a content ratio of amino acid to the triazole-based compound is 5 to 8, and this ratio is not disclosed by TSAI et al.

Page 16, lines 12-26 of the present application disclose that the content of the ratio of the amino acid to the triazole-based compound must be set in such a way that the ratio is a range of 5 to 8. When the content ratio is too small, the polishing ratio is lowered. However, when the content ratio is too large the polishing ratio is again lowered. In addition, when the content ratio is too large dishing is likely to occur.

As seen in Table 1 on page 30 of the present application, having a content ratio outside the cited range results in a polishing rate that is one-half to one-quarter of the polishing rate of a slurry that has a content ratio within the recited range or slightly decreases the polishing rate but doubles or nearly triples the etching rate. TSAI et al. neither teach the recited triazole nor recognize the recited ratio as critical for polishing the substrate.

Third, in order for a recited ratio to be obvious, a predictable outcome would have to be produced. MPEP §2144(05)IIB provides that a particular parameter must first be recognized as a result-effective variable, i.e., a variable which achieves recognized result, before the determination of the outcome or workable ranges of said variable might be characterized as routine experimentation. *In re Antonie*, 559 F.2d 618, 195 USPQ 6 (CCPA 1977).

TSAI et al. neither teach the criticality of their disclosed ranges for the chelating agents and corrosion inhibitors, nor recognize that the combination of the chelating agent and the corrosion inhibitors in a specific ratio would achieve a recognized result. Therefore, based on the teachings of TSAI et al., one of ordinary skill in the art would not find the recited content ratio of 5 to 8 obvious.

Claims 3, 4, and 6-8 depend from claims 1 and 2 and further define the invention and are also believed patentable over TSAI et al.

Claim 5 is rejected as unpatentable over TSAI et al. in view of WATTS et al. JP 11-238709. This rejection is respectfully traversed.

WATTS et al. is only cited for the teaching of a 1,2,4-triazole or its derivative as a triazole-based compound. WATTS et al. do not teach an amino acid as further required in the composition of claim 1.

Paragraph [0021] of WATTS et al. teaches that the 1,2,4- triazole may be 0.05 to 2.0% by weight. The same paragraph teaches that a carboxylate or citrate may be within the limits of about 20% by weight to about 0.2% by weight. Accordingly, WATTS et al. teach a carboxylate or citrate, not the recited amino acid.

Therefore, WATTS et al. could not teach the recited content ratio of the amino acid to the triazole-based compound being in the range of 5 to 8, as recited in claim 1. As set forth above, TSAI et al. do not disclose or suggest this content ratio. Since claim 5 depends from claim 1 and further defines the invention, the proposed combination of references would not render obvious claim 5.

Claims 1-4 and 7 are rejected as unpatentable over SINHA et al. 6,551,935. This rejection is respectfully traversed.

The position set forth in the Official Action is that column 5, lines 50 through column 6, line 40 and column 9, lines 14-23 of SINHA et al. disclose a triazole-based compound having a weight ratio of 5 to 8. However, this position is believed untenable for at least two reasons.

First, the compound disclosed by SINHA et al. and the above-noted passages refer to azoles such as imidazole, benzotriazole, benziimidazole, benzothizole, meraptabenzothiazole and tolytriazole. Such azoles do not fall within the recited triazole-based compound as defined on page 18, lines 7-10 of the present application.

As set forth above, a claim must be given its plain meaning unless applicant has provided a clear definition in the specification. Since applicant has provided a clear definition of a triazole-based compound in the specification, and since the compounds disclosed by SINHA et al. do not fall within that definition, SINHA et al. would not anticipate claim 1.

Further, column 5, lines 61-67 of SINHA et al. disclose that the inhibitor component 32 (azole) may make up about 0.05% to about 2% by weight of slurry. Column 6, lines 27-35 of SINHA et al. disclose that the complexing agents (amino acid) includes about 1% to about 10% by weight. However, there is no teaching

or suggestion in SINHA et al. that the content ratio of the amino acid to a triazole-based compound is 5 to 8. Even if theazole corrosion inhibitors taught by SINHA et al. were to include triazole-based compounds, SINHA et al. still fail to teach or suggest that a content ratio of amino acids to the triazole-based compounds is 5 to 8.

As set forth above, *In re Antonie* provides that a particular parameter must first be recognized as a result-effective variable, i.e., a variable which achieves a recognized result for the determination of the optimum workable range of the variable to be characterized as routine experimentation.

Based on the teachings of SINHA et al., one of ordinary skill in the art would not recognize that theazole compound of SINHA et al. as a triazole-based compound, as recited. In addition, based on the teachings of SINHA et al., one would not recognize the content ratio of the amino acid to the triazole-based compound as a result-effective variable that achieves a recognized result. Accordingly, one of ordinary skill in the art would not be motivated to use a content ratio of amino acid to triazole-based compound of 5 to 8 as recited in claim 1.

Claim 2 includes the same limitation as claim 1 and also would not be obvious in view of the teachings of SINHA et al. Claims 3, 4 and 7 depend from one of claims 1 and 2 and further define the invention and are also believed patentable over SINHA et al.

Claim 5 is rejected as unpatentable over SINHA et al. in view of WATTS et al. This rejection is respectfully traversed.

WATTS et al. is only cited for the teaching of a 1,2,4-triazole or its derivative as a triazole-based compound. WATTS et al. do not teach or suggest a content ratio of an amino acid to a triazole-based compound in the range of 5 to 8, as recited in claim 1. As set forth above, SINHA et al. do not teach or suggest what is recited in claim 1. Since claim 5 depends from claim 1 and further defines the invention, the proposed combination of references would not render obvious claim 5.

Claim 8 is rejected as unpatentable over SINHA et al. in view of ASANO et al. 6,679,929. This rejection is respectfully traversed.

ASANO et al. is only cited for the teaching of a silica polishing material containing colloidal silica. ASANO et al. do not teach or suggest the content ratio of amino acid to a triazole-based compound in the range of 5 to 8. Further, Table 1 of ASANO et al. teaches a ratio of glycine (amino acid) to benzotriazole (which is not a triazole based compound) as ratio between 62 and 1000. Accordingly, based on the teachings of ASANO et al., one of ordinary skill in the art would not be motivated to choose a content ratio of the amino acid to the triazole-based compound to be in the range of 5 to 8, as recited in claim 1. As set forth above, SINHA et al. do not teach or

suggest what is recited in claim 1. Since claim 8 depends from claim 1 and further defines the invention, the proposed combination of references would not render obvious claim 8.

New claims 9-11 include the definition of a triazole-based compound as set forth on page 18, lines 7-24 of the present application and that a contact ratio of the amino acid to the triazole-based compound is 5 to 8. The analysis above regarding claims 1 and 2 is equally applicable to claims 9-11. Accordingly, the new claims are also believed patentable over the cited prior art.

By way of further explanation, an object of the present invention is to use a polishing slurry to polish a copper-based metal film at a high polishing rate while preventing dishing. This object is achieved by having both an amino acid and one of 1,2,3-triazole, 1,2,4-triazole and their derivatives. However, not only are both of these ingredients used in the polishing slurry, these ingredients are used in a specific proportion to obtain the desired results.

The reference to WATTS does not disclose amino acids. The references to TSAI and SINHA do not disclose 1,2,3-triazole, 1,2,4-triazole and their derivatives. Since both the amino acid and above triazole-based compounds are required, it is not readily apparent why it would be obvious to combine these ingredients in the same slurry. Moreover, even if one were to

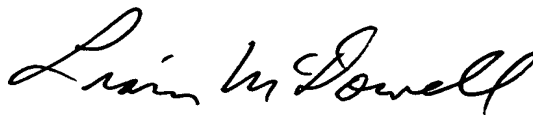
combine these references, the recited content weight ratio of 5 to 8 would still be lacking.

In view of the present amendment and the foregoing remarks, it is believed that the present application has been placed in condition for allowance. Reconsideration and allowance are respectfully requested.

The Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 25-0120 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17.

Respectfully submitted,

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APPENDIX:

The Appendix includes the following item:

- an amended Abstract of the Disclosure